

# Public policies, intergenerational income transmission and crime: a cross-country analysis

Maria Berrittella\*

\* *Dipartimento di Scienze Economiche Aziendali e Statistiche, Università degli Studi di Palermo, Viale delle Scienze, 90128 Palermo, Italy*

## Abstract

The aims of this paper are to demonstrate the relationship between crime and intergenerational earnings elasticity and to identify the public policies to mitigate the effects of crime. The modelling framework coupled with a preliminary cross-country analysis gives support to a positive association between crime and intergenerational income elasticity. This means that the intergenerational income mobility is limited in a country where a stronger criminal culture exists. Furthermore, the preliminary results suggest that the public policies oriented to increase the law enforcement level jointly to redistributive policies, which provide better-resourced public education, would be beneficial on income mobility in presence of crime.

*Keywords:* crime; education; human capital; intergenerational earnings elasticity; law enforcement.

*JEL Classification:* H50; I24; J62; P37.

## 1. Introduction

The seminal Becker and Tomes (1979, 1986) model is indisputably the main theoretical framework used by economists to understand the determinants of intergenerational income transmission. A rich literature has focused on how to measure intergenerational income mobility, how to compare it across countries and over time. Solon (2002) and Black *et al.* (2010) report rigorous survey analysis. Empirical studies have also investigated the determinants of the intergenerational earnings elasticity, which seems to vary with differences in factors relating to investment in human capital, public policy, neighborhood quality and local purchasing (Bratsberg *et al.*, 2007; Cardak *et al.*, 2013; Rothwell *et al.*, 2015; Sharkey *et al.*, 2017). However, in literature, less attention has been given to the causal effect of the socioeconomic factors (i.e. religious adherence, crime and violence, access to financing for housing or business formation, employment and internship opportunities) on intergenerational income mobility.

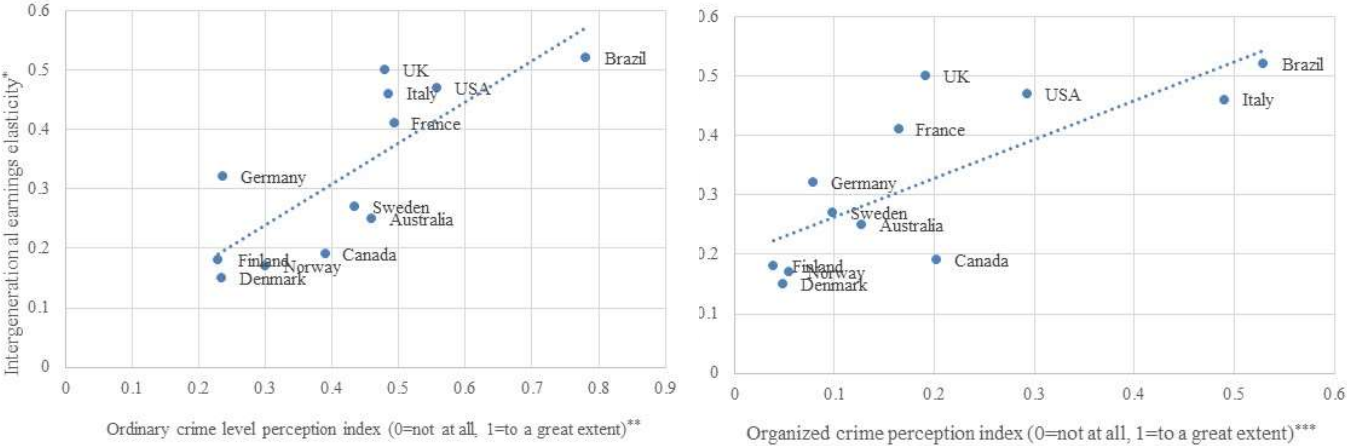
By focusing the attention on one specific social dimension, the aims of this paper are to provide a theoretical modelling framework associated with a preliminary empirical analysis on the relationship between the intergenerational income transmission and the level of crime, which may be a core mechanism affecting negatively the upward economic mobility.

To get a first insight, figure 1 and table 1 suggest a positive correlation between intergenerational income elasticity and crime, measured in terms of perception of ordinary (or common) crime (including violent and property crime) and perception of organized crime (defined as long-term criminal activity conducted in a structured and systematic manner, with the aim of generating illicit income). This positive correlation is also consistent with correlational evidence in literature (Chetty *et al.*, 2014; Sharkey *et al.*, 2017). Other motivations that suggest to give much attention to the mechanism linking income mobility and crime can be found in those studies that show education reduces crime (Lochner, 2004); whereas, other studies find a negative correlation between income inequality and crime (Neumayer, 2005; Brush, 2007, Choe, 2008).

If we consider that a higher intergenerational income elasticity implies a lower degree of income mobility, we have that the individuals from the lowest income class have more difficult to move upward in the income class if they were born in cities with high crime rates.

In the remainder of this article, the possible mechanism linking crime and intergenerational income elasticity will be discussed integrating the variables and parameters related to crime in the Becker and Tomes (1979, 1986) model. Furthermore, the cross-country analysis has identified the plausible public policy implications to mitigate the effects of crime on income mobility.

**Figure 1. Association between crime measures and income transmission**



\* Corak *et al.* (2006)  
 \*\* The Global Economy dataset (<https://www.theglobaleconomy.com/>)  
 \*\*\* Global Competitiveness Index Historical Dataset, World Economic Forum (<https://knoema.com/WFGCI2015/the-global-competitiveness-report>)

**Table 1. Correlation rate**

		Perception of	
		Ordinary Crime**	Organized crime***
	Preferred	0.79	0.76
Intergenerational earnings elasticity*	Lower bound	0.72	0.75
	Upper bound	0.82	0.77

\* Corak *et al.* (2006)  
 \*\* The Global Economy dataset (<https://www.theglobaleconomy.com/>)  
 \*\*\* Global Competitiveness Index Historical Dataset, World Economic Forum (<https://knoema.com/WFGCI2015/the-global-competitiveness-report>).

## 2. The model

In this section, the Becker-Tomes model is integrated with variables and parameters related to crime.

The parent derives utility from his own lifetime consumption,  $C_{t-1}$ , and his child lifetime income,  $y_t$ :

$$U_{t-1} = \log C_{t-1} + \log y_t \quad (1)$$

and allocates his income  $y_{t-1}$  between his consumption,  $C_{t-1}$ , and investment in child's human capital,  $I_{t-1}$ :

$$y_{t-1} = C_{t-1} + I_{t-1} \quad (2)$$

The technology translating parental investment into child's human capital,  $h_t$ , is

$$h_t = \theta \log(I_{t-1}) + e_t \quad (3)$$

where  $\theta > 0$  is a parameter indicating a positive marginal product for human capital investment, and  $e_t$  denotes child's initial endowment, that evolves through family generations according to a AR(1) process. In details, the culture of criminal behaviour of the family members is additively included in the child's initial endowment as follows:

$$e_t = (\lambda + z_i)e_{t-1} + \varepsilon_t \quad \text{with} \quad 0 < \lambda + z_i < 1 \quad (4)$$

where  $\lambda$  is the heritability coefficient,  $z_i$  is the heritability coefficient related to the culture transmission of criminal behaviour and  $\varepsilon_t$  is a stochastic error term.

The child's income,  $y_t$ , is here defined as follows:

$$\log y_t = (1 - g_i)ph_t + g_iv_t \quad (5)$$

where  $p$  is the rate of return on human capital,  $g_i$  ( $0 \leq g_i \leq 1$ ) is the fraction of time allocated to crime and  $v_t$  is the expected monetary return from committing a crime, that is defined following Freeman *et al.* (1996):

$$v_t = (1 - \pi_i)e^{-n} \log y_{t-1} \quad (6)$$

In eq. (6)  $\pi_i$  refers to the probability of arrest and  $n$  is the number of crimes.

Furthermore, the probability of arrest is an increasing, exponential function of the enforcement (E) per crime (n) given by

$$\pi_i = 1 - e^{-\frac{E}{n}} \quad (7)$$

Maximizing parent's utility of Eq. (1) under the budget constraint of Eq. (2) and using Eqs. (3) and (5), gives the optimal level of parent's investment in child's human capital:

$$I_{t-1} = \frac{(1-g_i)p\theta}{1+(1-g_i)p\theta} y_{t-1} \quad (8)$$

The intergenerational income transmission equation between  $y_t$  and  $y_{t-1}$  becomes:

$$\log y_t = (1-g_i)p\theta \log\left(\frac{(1-g_i)p\theta}{1+(1-g_i)p\theta}\right) + [(1-g_i)p\theta + g_i(1-\pi_i)e^{-n}] \log(y_{t-1}) + [(1-g_i)p]e_t \quad (9)$$

and the steady-state intergenerational income elasticity is

$$\beta_c = \frac{(1-g_i)p\theta + g_i(1-\pi_i)e^{-n} + \lambda + z_i}{1 + [(1-g_i)p\theta + g_i(1-\pi_i)e^{-n}](\lambda + z_i)} \quad (10)$$

Alternatively, considering eq. (7), we can write the steady-state intergenerational income elasticity as follows

$$\beta_c = \frac{(1-g_i)p\theta + g_i e^{-\frac{E}{n}n} + \lambda + z_i}{1 + [(1-g_i)p\theta + g_i e^{-\frac{E}{n}n}](\lambda + z_i)} \quad (11)$$

The intergenerational elasticity is an increasing function of  $p$ ,  $\theta$  and  $\lambda$ . Both the direct (through the elasticity of the child's income with respect to investment in the child's human capital,  $p\theta$ ) and indirect effect (through the heritability coefficient,  $\lambda$ ) are captured in eq. (10) or (11). As Solon (2014) argues, the intergenerational income elasticity is positive because  $p\theta > 0$  (richer parents allocate greater investment in their children's human capital making their children richer) and because  $\lambda > 0$  (richer parents tend to have more favourable endowments, which tend to be passed on to their children through genetic and cultural inheritance). The implications are that if a country displays less intergenerational income mobility than other countries, this could be because the country has stronger heritability, more productive human capital investment and higher returns to capital (Solon, 2004; Solon, 2014).

Furthermore, Eq. (10) and (11) show that the intergenerational income elasticity depends on two sets. One set includes the parameters and variables related to crime, that are the fraction of time allocated to crime ( $g_i$ ), the number of crimes ( $n$ ), and the culture transmission of criminal behaviour ( $z_i$ ); the other set includes policy variables related to public safety, that are the probability of arrest ( $\pi_i$ ) and the enforcement level ( $E$ ).

If we compare eq. (11) with the intergenerational income elasticity as calculated in Solon (2004), that is:

$$\beta = \frac{p\theta + \lambda}{1 + p\theta\lambda} \quad (12)$$

we have that  $\beta_c > \beta$ , this means that a country with more crime displays less intergenerational income mobility. The implication of the integration of crime in the Becker-Tomes model is that if we do not consider crime, the intergenerational income elasticity may result underestimated.

### 3. Data and methodology

A multiple regression model is used to capture the relationship between nonlinearity in intergenerational income transmission and crime. More formally, the empirical specification is constructed as follows:

$$IGE_i = \alpha + \beta_1 X_i + \beta_2 Edu_i + \beta_3 Crime_i + \beta_4 Law_i + \varepsilon_i \quad (13)$$

where  $IGE$  denotes the dependent variable related to a measure of intergenerational income elasticity,  $X$  is a set of control variables,  $Edu$  is the set of variables related to education policy,  $Crime$  denotes a set of variables related to crime,  $Law$  is the variable related to public safety policy and  $\varepsilon_i$  is the stochastic error term.

IGE is the measure of intergenerational income persistence: higher values indicate greater intergenerational persistence and, hence, lower relative income mobility. Data on the variable IGE come from the Global Database on Intergenerational Mobility (GDIM, 2018), which contains estimates of absolute and relative intergenerational mobility by 10-year cohorts.

The set  $X$  of control variables includes the main determinants of intergenerational income transmission commonly identified in various studies, which are the GDP per capita (transformed in natural logarithmic terms), the Gini index (as a measure of income inequality) and the variable related to domestic credit to private sector by banks (% of GDP) as measure of credit accessibility. The set  $Edu$  also includes two variables that have been found significantly related to IGE, they are the public education expenditure as percentage of GDP and the average schooling years, which is a common measure of human capital used in the empirical literature. This set allows of identifying the explanatory variables related to public policies devoted to education and the role of education. The set  $Crime$  includes variables related to three different types of crimes: organized, violent and white crimes. In details, a perception index of organized crime, which captures the extent of victimization of businesses, has been used as proxy of organized crime. Data on this index come from the World Economic Forum (WEF) survey, which is annually carried out among business executives of larger companies to identify obstacles to businesses (Van Dijk, 2007). This survey includes a question of whether organized crime, defined as “mafia oriented racketeering, extortion”, imposes significant costs and is a burden to businesses. The size of shadow economy has been used as proxy of the so called “white” crime. Data on shadow economy come from the data set developed by Schneider et al. (2010); that is, the largest existing data set on the size and trends of the shadow economy. The number of homicides (per 100,000 inhabitants) has been used as proxy of violent crimes and data have been collected from UN Office on Drugs and Crime's International Homicide Statistics database.

The reliability of police services has been used as a measure of the variable  $Law$  related to the public safety policy. Data on this index come from the World Economic Forum (WEF) survey. The sample includes 52 countries, which are listed in Table A.1 of Appendix. Data definitions, descriptive statistics and sources are summarized in Table A.2 of Appendix.

### 4. Results

Table 2 presents the correlation rates of the explanatory variables with the dependent variable and table 3 presents the ordinary least-squares (OLS) regression results. Both the sign of the correlation rates in table 2 and of the coefficients in table 3 confirm the expected effects of the modelling framework previously explained.

Table 2. Correlation coefficients with intergenerational income elasticity

GDP per capita (ln)	-0.59
Income inequality (GINI index)	0.69
Credit accessibility	-0.52
Human capital	-0.57
Government expenditure on education (% GDP)	-0.34
Organized Crime Index	0.61
Shadow economy	0.58
Number of homicides	0.54
Law enforcement	-0.58

Table 3. OLS estimates (dependent variable: intergenerational income elasticity)

Constant	0.323 (0.814)
GDP per capita (ln)	-0.012 (0.279)
Income inequality (GINI index)	0.014 (3.075)***
Credit accessibility	-0.001 (0.841)
Human capital	-0.015 (0.826)
Government expenditure on education (% GDP)	-0.012 (0.531)
Organized Crime Index	0.006 (0.116)
Shadow economy	0.001 (0.346)
Number of homicides	0.000 (0.078)
Law enforcement	-0.007 (0.154)
Number of observations	52
<i>F-test</i>	7.23***
Adj R <sup>2</sup>	0.523

Absolute t -statistics are displayed in parentheses under the coefficient estimates.

\* Statistically significant at the 10% level

\*\* Statistically significant at the 5% level

\*\*\* Statistically significant at the 1% level

There is a positive correlation and marginal effect between income inequality and intergenerational income elasticity confirming the existence of the so-called Great Gatsby Curve. Furthermore, since the correlation rate and coefficient upon GDP per capita is negative, we have that poorer and more unequal societies tend to have less income mobility. The coefficient upon the credit accessibility is negative, which suggests that countries with fewer credit constraints tend to have more income mobility. For the variables related to education, the coefficients upon the public education expenditure and the human capital are negative, these results implies that investment devoted to education has an increasing effect on income mobility. The coefficients upon the three variables related to crime are positive suggesting that the individuals from the lowest income class have more difficult to move upward in the income class if they were born in countries with high crime rates. The coefficient upon the variable related to rule of law is negative, this means that income mobility is more prevalent in countries where the public safety is well-assured.

## **1. Concluding remarks**

This paper is a first attempt to understand the mechanism linking intergenerational income elasticity and crime. In details, a theoretical modelling framework has been developed integrating the variables and parameters related to crime in the Becker and Tomes model. Furthermore, the results of the modelling framework have been supported by an empirical analysis.

The preliminary results of this paper suggest that: *(i)* if we do not consider crime, the intergenerational income elasticity may result underestimated; *(ii)* a country with more crime displays less intergenerational income mobility than other countries. This means that the intergenerational mobility is limited in a country where a stronger criminal culture occurs (i.e. the low rate of income mobility in Sicily, where the criminal phenomena called Mafia exists).

Furthermore, the results suggest two public policies to address the problem of criminality: law enforcement and investment in education. Law enforcement implies expenditure on public safety in order to increase the probability of arrest. Public support for education would be beneficial on income mobility, not only because the human capital is expected to translate into increased direct productivity, more innovation and higher levels of economic growth, but also because education is likely to enforce morality and legality values in the cultural transmission exerting negative effects on the size of crime.

In order to provide to policy-makers with a better understanding of the nexus between intergenerational income persistence and crime, future research should examine the potential role of coupling public safety and education expenditure in such a way that cross-country and time series are meaningful and do not derive from differences in data construction across countries.

## Appendix.

### A.1 List of countries

Table A.1 List of countries					
Code	Country	Income group	Code	Country	Income group
AUS	Australia	High-income economies	ALB	Albania	Developing economies
AUT	Austria	High-income economies	BOL	Bolivia	Developing economies
BEL	Belgium	High-income economies	BRA	Brazil	Developing economies
CAN	Canada	High-income economies	CHN	China	Developing economies
CHL	Chile	High-income economies	COL	Colombia	Developing economies
HRV	Croatia	High-income economies	ECU	Ecuador	Developing economies
CYP	Cyprus	High-income economies	EGY	Egypt, Arab Rep.	Developing economies
CZE	Czech Republic	High-income economies	GTM	Guatemala	Developing economies
DNK	Denmark	High-income economies	IND	India	Developing economies
FIN	Finland	High-income economies	JOR	Jordan	Developing economies
FRA	France	High-income economies	KAZ	Kazakhstan	Developing economies
DEU	Germany	High-income economies	KEN	Kenya	Developing economies
GRC	Greece	High-income economies	KGZ	Kyrgyz Republic	Developing economies
IRL	Ireland	High-income economies	MYS	Malaysia	Developing economies
ITA	Italy	High-income economies	MNG	Mongolia	Developing economies
JPN	Japan	High-income economies	MAR	Morocco	Developing economies
KOR	Korea, Rep.	High-income economies	NPL	Nepal	Developing economies
LVA	Latvia	High-income economies	PAK	Pakistan	Developing economies
NLD	Netherlands	High-income economies	PAN	Panama	Developing economies
NOR	Norway	High-income economies	PER	Peru	Developing economies
PRT	Portugal	High-income economies	ROM	Romania	Developing economies
SVK	Slovak Republic	High-income economies	RUS	Russian Federation	Developing economies
SVN	Slovenia	High-income economies	TZA	Tanzania	Developing economies
ESP	Spain	High-income economies	UGA	Uganda	Developing economies
SWE	Sweden	High-income economies			
CHE	Switzerland	High-income economies			
GBR	United Kingdom	High-income economies			
USA	United States	High-income economies			



## A.2 Description of variables, data source and summary statistics

Variable	Description	Mean	S.D.	Min	Max	Source
Intergenerational income elasticity	Intergenerational income persistence	0.50	0.26	0.11	1.10	Global Database on Intergenerational Mobility (GDIM, 2018)
GDP per capita (ln)	Natural Log of GDP per capita (US \$)	9.23	1.50	6.13	11.35	World Development Indicators, World Bank
Income inequality	Gini index	36.30	8.25	24.44	54.87	World Development Indicators, World Bank
Credit accessibility	Domestic credit to private sector by banks (% of GDP)	78.61	49.19	10.92	203.57	World Development Indicators, World Bank
Governement expenditure on education	Government expenditure on education (% GDP)	9.43	2.67	3.06	13.28	World Development Indicators, World Bank
Human capital	Average number of years of education received by people ages 25 and older	4.63	1.27	1.89	7.97	Barro and Lee database
Organized Crime Index	In a country, to what extent does organized crime (mafia-oriented racketeering, extortion) impose costs on	1.88	0.99	0.32	4.60	The Global Competitiveness Index Historical Dataset,
Shadow economy	Size of the shadow economy (% of GDP)	27.85	13.96	8.50	66.10	Schneider et al. (2010)
Number of homicides	Intentional homicides (per 100,000 people)	5.51	8.52	0.45	42.99	UN Office on Drugs and Crime
Law enforcement	In a country, to what extent can police services be relied upon to enforce law and order?" [1 = not at all; 7 = to a	4.66	1.26	2.07	6.68	The Global Competitiveness Index Historical Dataset,

## References

- Becker G.S., and N. Tomes (1979). An equilibrium theory of the distribution of income and intergenerational mobility, *Journal of Political Economy*, vol. 87(6), pp. 1153-89.
- Becker G.S., and N. Tomes (1986). Human capital and the rise and fall of families, *Journal of Labour Economics*, vol. 4(2), pp. 1-39.
- Black S.E., and P.J. Devereux (2010). Recent developments in intergenerational mobility, Discussion Paper No.4866, Institute for the Study of Labor (IZA), Bonn.
- Bratsberg B., Roed K., Oddbjorn R., Naylor R., Jantti M., Eriksson T., Osterbacka E. (2007). Non linearities in intergenerational earnings mobility: consequences for cross-country comparisons. *Economic Journal*, vol.117(519), pp. 72-92.
- Brush J. (2007). Does income inequality lead to more crime? A comparison of cross-sectional and time-series analyses of United States counties. *Economics Letters*, 96, pp. 264-268.
- Cardak, B.A., Johnston, D.W., Martin, V.L. (2013). Intergenerational earnings mobility: a new decomposition of investment and endowments effects. *Labour Economics*, 24: 39-47.
- Chetty, R., Hendren, N., Kline, P., Saez, E. (2014). Where is the land of opportunity? The geography of intergenerational mobility in the US. *Q. J. Econ.* 129 (4), 1553–1623.
- Choe J. (2008) Income inequality and crime in the United States. *Economics Letters*, 101, pp.31-33.
- Corak, M. (2006) Do Poor Children Become Poor Adults? Lessons from a Cross Country Comparison of Generational Earnings Mobility, Discussion Paper No.1993, Institute for the Study of Labor (IZA), Bonn.
- GDIM (2018) *Global Database on Intergenerational Mobility*. Development Research Group, World Bank. Washington, D.C.: World Bank Group.
- Lochner, L. (2004). Education, work and crime: A human capital approach. *International Economic Review*, 45, pp. 811–843.
- Neumayer, E. (2005) Inequality and violent crime: evidence from data on robbery and violent theft. *Journal of Peace Research*, 42, pp. 101-112.
- Rothwell, J.T., Massey, D.S. (2015) Geographic Effects on Intergenerational Income Mobility. *Economic Geography*, 91(1):83-106.
- Schneider, F., Buehn, A., & Montenegro, C. E. (2010). New estimates for the shadow economies all over the world. New Estimates for 162 Countries from 1999 to 2007. Policy Research Working Paper 5356, World Bank paper series.
- Sharkey, P., Torrats-Espinosa, G. (2017) The effect of violent crime on economic mobility. *Journal of Urban Economics*, 102: 22-33.
- Solon, G. (2002). Cross-Country Differences in Intergenerational Earnings Mobility, *Journal of Economic Perspectives*, vol. 16(3), pp. 59-66.
- Solon, G. (2004) A model of intergenerational mobility variation over time and place. In Corak M. (Ed.) *Generation Income Mobility in North America and Europe*. Cambridge University Press, Cambridge.
- Solon, G. (2014) Theoretical models of inequality transmission across multiple generations, *Research in Social Stratification and Mobility*, vol.35, pp.13-18.
- Van Dijk J (2007) Mafia markers: assessing organized crime and its impact upon societies. *Trends Organ Crime* 10(4):39–56